Mr. Davis
Algebra II

Exponential Function Word Problems

Name Mr. Davis, Solutions March 3, 2015

$f(x) = a(b)^x$ $2\,621\,440 = 20(2)^x$ Exponential

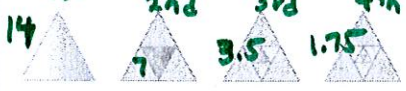
1. A zombie bacteria strain will double in size every 30 minutes. If a person is infected with 20 bacteria and it takes about 2,621,440 for a person to become a zombie, how long will it take for a person to mutate into a zombie? Write a formula to represent this.

Trial and error leads to $X = 17$ 17 30-minute periods is $17(30) = 510$ minutes $= 8.5$ hours

a) 68

Exponential

2. A sequence of equilateral triangles is constructed. The first triangle has sides 14m in length. To get the second triangle, midpoints of the sides of the original triangle are connected. What is the length of each side of the 5th triangle?



$f(x) = a(b)^x$ $f(x) = 14\left(\frac{1}{2}\right)^x$

$f(5) = 14\left(\frac{1}{2}\right)^5 = 0.875$ m

b) 337.5

$y = 3x + 35$ Linear $f(x) = 3x + 35$

3. A growing deer population increases by 3 animals per year. If the current population is 35 animals, what will it be in 11 year?

$x = 11$ $y = 3(11) + 35 = 68$ 68 animals

c) 240

there are 12 30-minute periods in 6 hours

Exponential

4. An infectious bacteria has leaked from a government facility. You discover that you are infected with 15 bacteria. You then discover that it doubles every 30 minutes. After 6 hours you will become contagious. How much of the strain of bacteria will you have?

$f(x) = a(b)^x$ $f(12) = 15(2)^{12} = 61,440$ bacteria

d) 8.5

Linear $f(x) = 32x - 16$ $f(8) = 32(8) - 16 = 240$ feet

5. During a free fall, a skydiver falls 16 feet in the first second, 48 feet in the 2nd second, and 80 feet in the third second. If she continues to fall at this rate, how many feet will she fall during the 8th second?

16, 48, 80, 112, 144, 176, 208, 240 (8th)

240 feet during the 8th second

e) 144

Linear $f(x) = 32x - 16$ $f(5) = 32(5) - 16 = 144$ ft

6. To prove that objects of different weights fall at the same rate, Galileo dropped the objects from the Leaning Tower of Pisa and they hit the ground at the same time. They fell about 16 ft in the 1st second, 48 ft in the 2nd second, and 80 ft in the 3rd second. How many feet would they fall in the 5th second?

See #5 above. 144 ft during the 5th second

f) 4132.21

Linear

7. If you have \$145 in your account at the beginning of week 13 and \$205 at the beginning of week 18, how much are you depositing weekly?

slope $m = \frac{205 - 145}{18 - 13} = \frac{60}{5} = \$12$ per week

g) 46794.34

Mr. Davis Solution Key

Exponential $f(x) = a(b)^x$ $f(x) = 75(2)^x$

8. A culture of bacteria doubles every 30 minutes. There are currently 75 bacteria, how many would there be after 4 hours?

there are 8 30-minute periods in 4 hours

$f(8) = 75(2)^8 = 19{,}200$ bacteria

h) 12

Linear $f(x) = 32x - 16$ see #5

9. Lets say you visit the Grand Canyon and drop a penny off the edge. The distance the penny will fall is 16 feet the first second, 48 feet the second, and 80 feet the third. What Is the distance the penny will fall in 7 seconds.

This does not ask how far the penny will fall during the 7th second.

$16 + 48 + 80 + 112 + 144 + 176 + 208 = 784$ ft

i) ~~208~~ 784

Exponential $f(x) = a(b)^x$

10. Iodine-131 is a radioactive element used to study the thyroid gland. It takes approximately 8 days for half of a sample of Iodine-131 to decay into another element. How much of an 80-mg sample would be left after 32 days?

There are 4 8 day periods in 32 days

$f(x) = 80\left(\frac{1}{2}\right)^x$ $f(4) = 80\left(\frac{1}{2}\right)^4 = 5$ mg

j) 0.32768

Exponential $f(x) = a(b)^x$

11. A population of fruit flies is growing in such a way that each generation is 1.5 times as large as the last. If there were 100 flies in the 1st generation, how many would be in the 4th generation?

$f(x) = 100(1.5)^x$ $f(3) = 100(1.5)^3 = 337.5$ fruit flies

k) 5

Exponential $f(x) = a(b)^x$

12. George's current salary is $40,000. His annual pay raise is a percentage of his current salary. What would his salary be if he got four consecutive 4% pay raises?

$f(x) = 40000(1+.04)^x$ $f(4) = 40000(1.04)^4 \approx \$46{,}794.34$

l) 61,440

Exponential $f(x) = a(b)^x$

13. A one-ton ice sculpture is melting so that it loses 1/5 of its weight per hour. How much will be left after 5 hours? Write your answer in pounds.

$f(x) = 1\left(\frac{4}{5}\right)^x$ $f(5) = 1\left(\frac{4}{5}\right)^5 \approx 0.32768$ of a ton

m) 0.875

Exponential $f(x) = a(b)^x$

14. A colony of bacteria began with 200. It grows at a rate of 40% every 20 minutes. How many will there be in 3 hours?

$f(x) = 200(1+.4)^x$ $f(9) = 200(1.4)^9 \approx 4{,}132.21$ bacteria

there are 9 20-minute periods in 3 hours

n) 19,200